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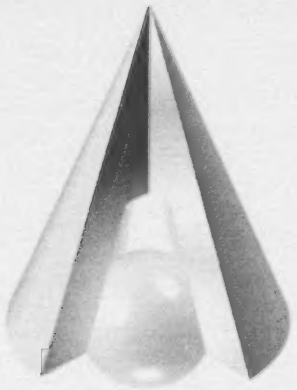
Which Human Capital Characteristics Best Predict the Earnings of Economic Immigrants?



by Aneta Bonikowska, Feng Hou and Garnett Picot

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..	not available for a specific reference period
...	not applicable
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0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

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Which Human Capital Characteristics Best Predict the Earnings of Economic Immigrants?

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Abstract

While there is an extensive literature on immigrant entry earnings in Canada, there is a lack of knowledge, when predicting immigrant earnings, on the relative importance of various human capital factors, such as language, work experience, age, and education. This paper addresses two questions. First, what is the relative importance of such observable human capital factors when predicting the earnings of economic immigrants (principal applicants) who are selected through the points system? Second, does the relative importance of these factors vary in the short, intermediate, and long term? Using the Longitudinal Immigration Database, the study finds that the predictive power of immigrant characteristics (measured at landing) changes with years spent in Canada. Official-language background at landing, and Canadian work experience before immigration, are the best predictors of annual earnings in the first two years after landing for economic immigrants (principal applicants). However, educational attainment at landing and age at landing (a proxy for foreign work experience) are the best predictors of longer-term earnings (10 to 11 years after landing). Some interaction effects are also important. The predictive power of education and age (in part a proxy for foreign work experience) is influenced by their interaction with official-language skills and Canadian work experience. The earnings advantage of higher education is much larger among principal applicants who have strong rather than weak official-language skills. Immigrants whose mother tongue is English or French do not experience a significant negative effect of age on earnings. Finally, many factors beyond those studied here affect immigrant earnings. The predictive power of regression models could be increased with improved data sources.

Keywords: immigrants, human capital, earnings, language

Executive summary

While an extensive literature examines the association between immigrants' characteristics and their earnings in Canada, there is a lack of knowledge regarding the relative importance of various human capital factors, such as language, work experience and education when predicting the earnings of economic immigrants. The decline in immigrant earnings since the 1980s, which was concentrated among economic immigrants, prompted changes to the points system in the early 1990s and in 2002, in large part, to improve immigrant earnings. Knowledge of the relative role of various characteristics in determining immigrant earnings is important when making such changes. This paper addresses two questions. First, what is the relative importance of observable human capital factors when predicting earnings of economic immigrants (principal applicants), who are selected by the points system? Second, does the relative importance of these factors vary between the short, intermediate, and long terms?

This research employs Statistics Canada's Longitudinal Immigration Database (IMDB). The analysis is restricted to immigrants who are principal applicants in the Economic Class (specifically, federal skilled workers and nominees in the provincial nominee programs), aged 20 to 54 in the year of landing, and with positive earnings in any given year after immigration. Since the Quebec selection system is somewhat unique in Canada, economic immigrants (principal applicants) entering through that system are excluded. To assess the effect of human capital variables on annual earnings in the short term (first 2 full years in Canada) and intermediate term (5 and 6 years after landing), immigrants who landed from 2002 to 2004 are considered. Outcomes of immigrants who landed between 1997 and 1999 are examined to assess the long-term (10 and 11 years after landing) effects on earnings. The results were verified using other cohorts.

The explanatory variables include factors available for use in an immigration selection system, and available in the IMDB. They include age at landing, educational attainment at landing, official-language characteristics at landing, years of Canadian work experience prior to landing, years of study in Canada prior to landing, spouse's educational attainment at landing, spouse's years of Canadian work experience prior to landing, and spouse's years of study in Canada prior to landing.

The study finds that the relative predictive power of various human capital variables varies, depending on the number of years immigrants have spent in Canada. Language at landing is one of the most important variables in predicting earnings in the short term. But this factor becomes less important as an entering cohort increases its tenure in Canada. A similar pattern emerges for the Canadian work experience prior to landing. It is a strong predictor of earnings in the short term, but less so in the longer term. Education and age at landing are the two variables for which predictive power increases with time spent in Canada. While true for all cohorts, this was most evident in the unique situation faced by the entering cohorts of principal applicants during the early 2000s. Those with higher education earned little more than those with less education immediately following landing. But the earnings trajectory of the highly educated is much steeper, so that a significant earnings advantage for higher education developed after 5 to 10 years in Canada. In the longer term, education becomes the best predictor of earnings among the available variables. Generally, the older the economic immigrants at landing, the less well they do in the labour market. This effect increases with time spent in Canada, making age a relatively strong predictor of longer-term earnings, along with education.

Some interaction effects are also important. The predictive power of education and age (in part a proxy for foreign work experience) is influenced by their interaction with official-language skills and Canadian work experience. The earnings advantage for higher education is much larger among principal applicants who have strong rather than weak official-language skills. Immigrants with a mother tongue that is English or French do not experience a significant negative effect of age on earnings. Finally, many factors beyond those studied here affect immigrant earnings. The predictive power could be increased with improved data sources.

1 Introduction

An extensive literature examines the association between immigrants' characteristics and their subsequent labour market earnings. In Canada, the majority of the research on immigrant earnings has attempted to explain why entry earnings declined since the 1980s (e.g., Aydemir and Skuterud 2005; Green and Worswick 2010; Hou and Picot 2014; Picot and Sweetman 2005; Reitz 2007). The focus was on the role of changes in immigrant characteristics and Canadian labour market demand in the entry earnings decline.

However, there is a gap in knowledge regarding the *relative importance* of various human capital characteristics, such as language, work experience and education when predicting immigrant labour market outcomes. Filling this gap in knowledge may be particularly important for understanding labour market outcomes of economic immigrants, among whom the decline in earnings was concentrated (Picot, Hou and Qiu 2014). This decline has prompted various government policy responses. The points allocated to particular characteristics in the selection system for economic immigrants (principal applicants) were altered in the early 1990s, and again in 2002, in part to improve immigrant earnings. Knowledge of the relative role of various characteristics in predicting immigrant earnings is important for such changes. This paper fills that research gap by addressing two questions. First, what is the relative importance of observable human capital factors when predicting earnings of economic immigrants (principal applicants) who are selected by the points system? For example, is official-language ability more effective than, say education, as a predictor of immigrant earnings? Second, does the relative importance of these factors vary in the short, intermediate, or long term? Characteristics that allow immigrants to "hit the ground running" at landing (possibly Canadian work experience) may be different from those that provide the basis for longer-term success (possibly education).

2 Human capital factors and immigrant selection

Human capital factors have played an important role in the selection of economic immigrants since the move to a form of points system in the 1960s. The "human capital model" of selection of immigrants, enhanced in the 1990s and the early 2000s, emphasizes the selection of immigrants with characteristics that will stand them in good stead in the longer term, allowing them to compete for jobs in a knowledge-based economy and adapt to cyclical or structural changes in economic conditions. Furthermore, it is not just the individual human capital characteristic that is of interest. How one factor interacts with another is also consequential. For example, education may have a much greater effect on earnings if immigrants possess strong English- or French-language skills. That is, education and language may interact to affect immigrant earnings.

Recently, however, there has been a renewed emphasis on the selection of immigrants to fill specific occupational skill shortages, and on their short-term outcomes (see Ferrer, Picot and Riddell [2014] for a review). Any future selection system is likely to be a hybrid that considers both short- and longer-term outcomes, with both human capital and specific occupational requirements. Ideally, a selection system for economic immigrants might be driven by information on both the demand and supply side of the labour market. It would take into account labour demand in particular occupations, as well as occupational labour supply and other supply-side features, such as the characteristics of immigrants that generate higher earnings. However, the information requirements of such a system may be beyond our current knowledge. This paper focuses on one particular dimension, the relationship between the human capital characteristics of immigrants and their earnings.

Given the desire to improve earnings among new immigrants, following the decline since the 1980s, policy analysts reasonably turn to human capital factors that best predict earnings as a major part of the selection system for economic immigrants. Such an approach raises questions that the research has not answered to date. Basically, which human capital variables are the best predictors of the earnings of economic immigrants?

A large volume of Canadian research has looked at the effect of specific human capital characteristics on earnings (see Picot and Sweetman [2012] for a review of recent earnings-based research), but no known papers have directly addressed the issue of the relative importance of the factors. A few recent papers have touched on the importance of human capital variables within the context of a redesign of the points-based selection system.

McHale and Rogers (2008) argue for an actuarial-based (i.e., statistical) selection system that allocates points, based on the effects of human capital and other variables on immigrant earnings, combined with more subjective evaluations provided by prospective employers. McHale and Rogers note that, although a statistical approach has limited predictive power, it has been shown to be superior to those based on expert-based judgement.

Beach, Worswick and Green (2011) provide an extensive analysis of immigrant selection with regard to the effects of human capital characteristics on the earnings of economic immigrants. They find that altering the characteristics (e.g., education, language) of immigrants via the points-based system does, indeed, affect entry earnings. Earnings in the longer term, or lifetime earnings, are not considered in their study. Based on their analysis, they made a number of recommendations, including (1) improve the language (French or English) skills of immigrants and measure language fluency more objectively; (2) assess potential immigrants' foreign education and professional credentials before they arrive; (3) reduce the average age of economic immigrants, given that younger immigrant workers achieve greater labour market success than older entering immigrants; (4) reduce the emphasis on foreign work experience, since it is found to have no economic returns.

Sweetman and Warman (2013) also find that immigrants who receive higher points from their human capital characteristics, as evaluated by the points system, indeed, have higher earnings. They show that a one-point increase in the selection system is associated with a 2% increase in earnings and a 0.5% increase in the probability of being employed. That is, the points system, which, in part, reflects the human capital characteristics of the immigrant, appears to work as it was intended to. Beach, Green and Worswick (2011) reach a similar conclusion. These studies did not examine whether and how immigrant earnings can be improved through knowledge of human capital characteristics that best predict earnings.

3 Data, variables, and method

3.1 Data

This research employs Statistics Canada's Longitudinal Immigration Database (IMDB). This longitudinal data set contains information on all immigrants who have entered Canada since 1980, and have filed at least one tax return. Around 95% of working-age Canadians file a tax return in any given year. The database contains immigrant demographic characteristics at the time of landing and earnings in years after landing.

The population used in this analysis consists of immigrants who were principal applicants in the Economic Class (specifically, federal skilled workers and nominees in the provincial nominee programs),[1] aged 20 to 54 in the year of landing, and with positive earnings in the year of interest.[2] Economic immigrants (principal applicants) entering through the Quebec system are excluded because of the uniqueness of that system. The main analysis focuses on immigrants in two landing cohorts. Immigrants who landed from 2002 to 2004 are considered when assessing the effect of human capital variables on earnings in the short and intermediate term. To assess the longer-term effects on earnings, immigrants who landed between 1997 and 1999 are considered. The short- and intermediate-term analysis was also conducted using the 1997–1999 cohort. Results were verified using other cohorts, notably 2005–2008 for entry earnings, and 1992–1994 for long-term earnings.

3.2 Variables

Annual earnings during the first 2 full years in Canada after landing were used to represent short-term outcomes, earnings 5 to 6 years after landing for intermediate outcomes, and earnings 10 to 11 years after landing for long-term outcomes.

There are some restrictions on the explanatory variables used in the models. To render the analysis policy-relevant, it is important to include only those variables that are available at the time of entry, that could potentially be included in an immigrant selection system, and for which historical data are available. For example, for various legal and historical reasons, the source country is not used as a criterion in the points system. Its use could be considered discriminatory. Hence, the source country is excluded from the list of explanatory variables. Its inclusion in the regression model could alter the effects of other variables, such as knowledge of official languages (which is correlated with source country), when predicting earnings.

Furthermore, the contributions of the variables could only be evaluated using historical data. Hence, the explanatory variables are also restricted to those available in the best existing data source for this purpose, the IMDB. With these constraints, the independent variables, all of which are treated as discrete and measured at landing, comprise age (7 levels), educational attainment (11 levels), language characteristics (7 levels), years of Canadian work experience prior to landing (7 levels), years of study in Canada prior to landing (7 levels), spouse's educational attainment (11 levels), spouse's years of Canadian work experience prior to landing (5 levels), and spouse's years of study in Canada prior to landing (5 levels). Appendix Table 1 shows how these variables were specified.

Two variables require some explanation. The language variable is constructed by combining information on the mother tongue and on the official language spoken. This approach takes full advantage of available variables in the IMDB. In the current points system, however, language ability for many immigrants is determined by a language test, a superior approach. Language scores from a test may be better predictors of earnings than the variable employed here. Hence, the predictive power of the language variable may be underestimated in this work.

Regarding Canadian work experience, many immigrants worked in Canada on temporary visas before becoming permanent residents, and, thus, acquired Canadian work experience before landing. The Canadian work experience variable was derived from the number of years that an

1. Economic immigrants enter through several different programs, but predominantly as federal skilled workers or through provincial nominee programs. While economic immigrants comprise principal applicants as well as their spouses and dependants, this study focuses exclusively on the principal applicants. The principal applicants are selected for their potential to contribute to the Canadian economy.
2. There is a reasonable argument for including all economic principal applicants with zero earnings, as well as those with positive earnings, if one wants to understand their overall labour market outcomes. As a sensitivity test, some results are duplicated when zero earners are included, and are reported in the results section (Section 4).

individual held work permits. Similarly, a number of immigrants studied in Canada on student visas before becoming permanent residents.[3]

The number of categories used for each of the discrete variables, such as education, can influence the contribution of the variable to the R-squared—an important issue in this paper, given the chosen methodology described below. Typically, the more detailed a variable (e.g., the finer the education-level groupings), the greater the variation in earnings accounted for by that variable. For each discrete variable, this study employed the maximum number of categories available in the source data, unless such level of detail was not supported by sufficient sample size.

3.3 Methods

To determine which human capital characteristics best estimate or predict the earnings of entering immigrants, the analysis relies on the extent to which an independent variable accounts for the variation in earnings. Variables that account for a large share of the variation in earnings of immigrants (i.e., provide information on why some earn more than others) are considered to be most important when attempting to estimate an immigrant's earnings; those that account for little of the earnings variation, less so. The most commonly used approach to assessing which independent variables best estimate or predict the dependent variable is the contribution of each explanatory variable to the overall R-squared—the "goodness of fit" statistic—in a regression equation (Nathans, Oswald and Nimon 2012).[4]

Strictly speaking, the results on the importance of each independent variable, based on its contribution to the model R-squared, should not be inferred beyond the study sample. For example, if the 2002–2004 cohort of immigrants is used to estimate the model and the contribution of each independent variable to the R-squared, the results will definitely be applicable to that cohort. But for some future cohort (say the 2006–2008), the relationship between the independent and dependent variables may have changed somewhat because of changes in economic conditions, changes in supply or demand for particular types of immigrants, or for other reasons. Hence, the R-squared can neither precisely determine the ability of the regression model to predict future values of the dependent variable, nor the importance of each independent variable. However, the relative importance of the independent variables, such as education, age, language, and work experience in predicting earnings does not change significantly over short periods of time.[5] Hence, it is reasonable to use the R-squared statistic as a proxy for the ability of the regression model to predict the earnings of immigrants selected with particular characteristics.

There are alternative approaches. When evaluating time-series prediction models, often the historical sample is split in two (see Woodridge 2003). Part of the sample is used to estimate the model. The model is then applied to the second part of the sample to predict the dependent

3. Years of temporary work permits and study permits are not part of the regular IMDB. These are supplementary variables that are merged with the IMDB.
4. The R-squared statistic measures the share of the overall variation in the dependent variable (earnings) accounted for by the independent variables. The R-squared varies between 0 and 1. A low R-squared implies that knowledge of the independent variables will only account for a small proportion of the variation in the earnings of immigrants. A high R-squared implies that, if the values of the independent (explanatory) variables are known, the regression model can fairly accurately estimate the value of the dependent variable (here, earnings). An independent variable that contributes the most to the model R-squared is deemed to be most important in predicting immigrant earnings. In other words, the independent variable that reduces the error of the estimate (the difference between the estimated and actual value of the earnings) the most is deemed to be most important. The error associated with the estimated earnings of an immigrant, using this approach, is measured by its squared value. This error could be measured in other ways.
5. As will be seen, there is one significant exception. The effect of education on immigrants' earnings changed significantly between the 1990s and 2000s.

variable and evaluate the predictive ability of the model. The mean absolute error[6] of the prediction is used to evaluate the predictive ability of the model. Such an approach could be used here. One could assess the extent to which each independent variable reduces the mean absolute error of the prediction in the second half of the sample by adding or dropping one variable at a time and examining the effect on the error. However, this does not solve the problem of using a model estimated on a historical sample to predict future values of the independent variable. The error of the prediction will depend entirely on the time period used to evaluate the model. Or, in our case, the extent to which an independent variable is seen to contribute to the predictive power of the model will depend on the time period selected, and whether the relationships between the dependent and independent variables had changed between the period used to estimate the model and that used to evaluate the contribution of the independent variables.[7] All things considered, an analysis of the contribution of the independent variables to the R-squared is believed to be the most robust way to proceed. The extent to which a variable's contribution changes over time is assessed, and the implications of such a result are discussed.

The analysis starts with the unique contribution of each variable to the overall R-squared value. The unique contribution of a specific factor to the R-squared is determined by first running the full model, and then dropping the variable of interest from the regression. The reduction in the R-squared is regarded as the independent or unique contribution of the variable of interest in explaining the variance of immigrant earnings (i.e., the R-squared). Independent variables are often correlated, and there may be shared variance between the variables. For example, language skill (in English or French) and education may be correlated. When language is dropped, the R-squared is reduced by the amount of the independent effect of language on earnings. To the extent that language and education have overlapping effects, some of the language effect may still be reflected in the education variable. Hence, one can think about this exercise as one of measuring the predictive power of adding (or dropping) each variable, conditional on the other variables being present. In terms of developing a points system, this approach reflects a variable's unique contribution to a points system, which includes all the other independent variables. Because only the independent or unique contribution of each variable is being captured, the contribution of all variables does not add up to the total R-squared value for the regression.

In addition to the unique contribution of each factor, the common contribution because of the shared variance between factors can also be calculated. In the example above, language skills and education each had a unique contribution to the overall regression R-squared. But, there may also be a contribution to the R-squared, because they operate in combination with each other. Accounting for the common contribution of these variables to the overall R-squared could alter our view of which variables are the best predictors of immigrant earnings. The common contribution is determined with an approach that partitions the model R-squared into that unique to each independent variable and to that associated with each possible combination of independent variables (the common variance). This commonality analysis (Nathans, Oswald and Nimon 2012; Rowell 1996; Amado 1999) produces values of the unique and common contributions that sum to the total R-squared. As the number of independent variables increases, the number of possible combinations of these variables (in the common component) becomes large quite quickly. This makes both the analysis and its interpretation more difficult. To maintain a manageable analysis, the analysis focused on the four independent variables that are seen to be the most significant predictors in the first approach, and the combinations of

6. The error is the difference between the actual and predicted values.
7. For instance, the relationship between education and earnings changed between the 1990s and the early 2000s. If a model were estimated using early 1990s data, and evaluated using data from the late 1990s, education would be seen to be a strong predictor. But if it were evaluated using early 2000s data, it would be seen to contribute little to the prediction. The same can be learned by analyzing the contribution of the independent variables to the R-squared for different historical periods.

these variables likely contribute the most to the R-squared (i.e., the variables most likely to be correlated).

Assessing the causal effect of a particular variable—say, education—on immigrant earnings, the ultimate goal of the majority of the regression analysis conducted in labour economics, is not the primary objective of this analysis. The goal here is to get the best possible fit to the data using the variables available. In essence, the analysis is attempting to develop a prediction model using the variables that most contribute to the goodness of fit. It is not problematic here if some of the variables are proxies for other unmeasured variables, as long as this proxy value remains more or less constant through time. For example, Canadian work experience may be in part a proxy for other unmeasured variables, such as an understanding of the Canadian labour market, the availability of networks, and so on. These proxy relationships could be the underlying reasons for the contribution of Canadian work experience to the goodness of fit. That is acceptable, since the inclusion of Canadian work experience would capture the effects of those unmeasured factors in predicting immigrant earnings.

To determine whether the relative importance of the variables may vary with time spent in Canada, the outcome variable is altered from earnings during the first 2 full years in Canada after landing, to earnings after 5 and 6 years, and, finally, to earnings after 10 and 11 years following landing. The contribution of each variable to the R-squared in each of these three models is used to assess how that variable's relative importance changes with the increased length of residence in Canada.

One could use discounted lifetime earnings as the outcome variable. However, such an approach would mask the change in the relative importance of the various human capital variables between the short and longer term, one of the objectives of this paper.

This study also assesses the extent to which particular interaction terms might affect the predictive power of the regressions. For example, education may have much higher predictive power if it is interacted with French- or English-language ability. That is, education may have little predictive power (low R-squared) if immigrants have poor English or French language skills, but much higher predictive power if their language skills are strong. Poor language skills may prevent immigrants from economically benefitting from their higher education. If education is interacted with language skills in the regression equation, such effects can be captured. There may be important interaction effects between other variables as well. The importance of interaction effects is assessed by any increase in the regression R-squared, resulting from specific interaction terms being added to the regression model.

4 Results

4.1 The best predictors of short-term earnings

To determine the best predictors of earnings in the short term, an ordinary least squares (OLS) regression is constructed with log annual earnings during the first two full years in Canada as the dependent variable. The sample consists of economic immigrants (principal applicants) who entered Canada between 2002 and 2004, were aged 20 to 54 at entry, and had employment earnings in at least one of the first two years in Canada.[8]

The regression coefficients are shown in Appendix Table 1. The results are consistent with earlier work. Higher entry earnings are correlated with being a younger adult-aged immigrant, having an English language or bilingual (French/English) background, and having more years of

8. Each of the first two years is a separate observation. Any year for which there is no earnings reported is dropped from the sample.

Canadian work experience. The effect of higher education on entry earnings is, generally speaking, statistically insignificant.[9] This may seem unusual, but earlier work by Picot, Hou and Qiu (2014), showed that the earnings advantage that highly educated entering immigrants traditionally held over the less educated during the first few years in Canada virtually disappeared among the entering cohorts of the 2000s. They also found that, since earnings increased much faster among the more highly educated new immigrants, the earnings advantage of the highly educated increased with years spent in Canada. Similar results are observed in this work.

But the primary concern here is the relative predictive power of each independent variable, which is determined by each variable's contribution to the R-squared. The R-squared in Model 1 for the 2002–2004 cohort, in Table 1, is 13.6%. Clearly, much of the variation in individual entry earnings among entering principal applicants remained unexplained by the factors in the model. When using data on individuals in a typical earnings model with only human capital factors, the R-squared values more often range between very low values, as low as 3%, and 30%.[10] If job or firm characteristics were added to the model, the R-squared may reach 50%. Many variables that affect earnings are typically not observable, and cannot be easily imbedded in any kind of a points system. Such variables may include motivation, skill at personal relationships, ability to learn quickly, and judgement. There are other variables that might increase the predictive power of an entry earnings regression model (or points system), and that are measurable, but the data are simply not available at this time. Such variables might include the specific university from which an immigrant graduated, his or her field of study, occupation, how successful the immigrant has been in his or her occupation, and so on.

Given the data and variables available, language ability and Canadian work experience emerge as the most important predictors of earnings in the short term. When language is dropped from the regression equation, the R-squared value drops by 3.2 percentage points, and when Canadian work experience is dropped (after language is put back), it falls by 4.5 percentage points. Some of the effect of the work experience variable may be related to arranged employment. It was difficult to separate these effects in the data. However, data for a later cohort allowed a more precise separation of arranged employment and Canadian work experience, and the Canadian work experience was seen to dominate arranged employment.[11] Hence, likely most of the effect observed here is related to Canadian work experience.

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9. Recall that the source region is not controlled for in these regressions because it cannot reasonably be used in any points system. However, to determine if the effect of education varies by source region, separate regressions are run for principal applicants from three source-region groups: English-speaking countries with developed economies, other developed economies, and developing economies. During the first two years in Canada, higher education did yield significant earnings premiums for principal applicants from English-speaking developed economies (e.g., bachelor's degree holders earned 40% to 64% more than those with 10 to 12 years of schooling), but not from other developed economies or developing economies. That is, shortly after landing, firms paid a premium for higher education from the United States, the United Kingdom, Australia and New Zealand, but not from other countries, from which most immigrants originate. A model is also constructed to include all economic principal applicants and to include a source region variable. In this case, the effect of education on earnings increases marginally (as compared with the results in Table 1 without source region).
10. The R-squared is typically much higher with aggregate group data rather than with individual-level data. That is because much of the individual variation in earnings is cancelled out when the observations are placed in groups.
11. The data from the *Immigration and Refugee Protection Act* (IRPA) cohorts of the mid-2000s was used to evaluate the importance of Canadian work history and arranged employment. These variables were determined directly and more accurately in these data. For economic immigrants entering under the IRPA legislation between 2003 and 2008, it was known more definitely whether arranged employment and Canadian work experience were present. This sample consisted of workers entering as federal skilled workers. Regressions were run using the same dependent variable and similar independent variables as described in the main text earlier. Having had arranged employment (compared to not having had it) increased earnings during the first two full years after landing by around 25%. While significant, this is relatively small compared with the effect of some other variables, such as having had Canadian work experience, which increased earnings by around 65%.

Language and Canadian work experience were the only two variables[12] that had a large effect on the predictive power of the model.[13]

As noted in the methods section, some of the independent variables will be correlated, and, hence, beyond the unique contribution of each variable to the R-squared, some variables will make a contribution to the R-squared through shared variance with another variable, or what is referred to in this approach as "common components" (Nathan, Oswald and Nimon 2012; Rowell 1996). Rather than compute and display all possible combinations of the independent variables, the analysis focuses on those involving the most important predictors or likely predictors: age at landing, education, language and Canadian work experience. Among the common components, only the language–work experience one makes a significant contribution to the R-squared (first column, Table 1). This demonstrates that, in addition to the unique contribution of these two variables, they also operate in combination in predicting earnings. But none of the other likely candidates seem to have a large common contribution. Hence, of the variables available, language and Canadian work experience are the two most important predictors of earnings in the short term, at least they were for this cohort of entering immigrants.

12. The source country is not included in the regression equation. Separate models were estimated for three different source region groupings (English-speaking source regions, other developed economies and developing economies), and the coefficients on the Canadian work experience variable, were similar across source regions, suggesting that Canadian work experience matters, no matter from which region one originates. One overall model was also estimated to include the source region variable, and the coefficients on the Canadian work experience variable changed little. When controlling for source region, the effect of language on earnings is reduced considerably. That is expected, since source region and language (as measured here) are highly correlated. However, it is likely language, not source region, that truly affects earnings, and, hence, the proper way to proceed is to include language, but not source region in the regression.
13. This regression was based on principal applicants (economic immigrants) with positive earnings. There is an argument for also including those with zero earnings, since they, too, were selected by the points system. When this is done and Table 1 reproduced, two relevant results emerge. First, the R-squared falls significantly. For example, for the short-term outcomes (1 to 2 years in Canada) based on the 2002–2004 cohort, the R-squared falls from 13.6 to 5.3. Second, the variables that are the most important predictors of earnings remain largely the same in most cases. One exception is for the long-term outcomes (10 to 11 years in Canada) based on the 1997–1999 cohort, where education is no longer an important predictor, accounting for only about 10% of the R-squared value. In the models based on immigrants with positive earnings, it accounted for 25% of the model R-squared.

Table 1
The relative importance of predictors of earnings for principal applicants (economic immigrants) by years since landing and landing cohort

	2002–2004 cohort		1997–1999 cohort		
	1 to 2 years	5 to 6 years	1 to 2 years	5 to 6 years	10 to 11 years
	Model 1	Model 2	Model 1	Model 2	Model 3
R-squared of the full model	0.136	0.070	0.096	0.078	0.085
Unique contribution to the R-squared					
Age	0.003	0.012	0.011	0.015	0.020
Education	0.001	0.005	0.009	0.016	0.021
Language	0.032	0.016	0.023	0.017	0.014
Canadian work experience	0.045	0.016	0.030	0.011	0.006
Studies in Canada	0.001	0.000	0.002	0.001	0.001
Spouse's education	0.001	0.002	0.002	0.003	0.003
Spouse's Canadian work experience	0.002	0.001	0.000	0.000	0.000
Spouse's studies in Canada	0.000	0.000	0.000	0.000	0.000
Contribution of selected common components to the R-squared					
Age, education	0.000	0.000	0.000	0.000	0.000
Age, language	-0.001	-0.002	-0.001	-0.001	-0.002
Age, Canadian work experience	-0.001	-0.001	0.000	0.000	0.000
Education, language	0.000	-0.001	-0.002	-0.002	-0.002
Education, Canadian work experience	0.003	0.001	0.004	0.003	0.003
Language, Canadian work experience	0.019	0.008	0.011	0.005	0.003

Note: The variables listed on the left-hand side of the table were measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

4.2 Predicting earnings in the intermediate term

An identical model is run to determine the predictive power of these variables regarding earnings after 5 to 6 years in Canada, for the 2002–2004 arrival cohort (Appendix Table 1). The overall R-squared falls from 13.6% in the model of short-term earnings (Model 1), to 7.0% in the intermediate-term model (Model 2) (Table 1). The included variables are better at predicting entry earnings than intermediate-term earnings. That is likely because, as immigrants acquire experience in Canada, a convergence in the values of these variables for entering immigrants occurs. For example, if there is a large divergence in language ability at entry, which would affect earnings, this divergence would be reduced over time. After a few years, many immigrants who had poor official-language skills would have improved them, so the predictive power of language skills at entry would be reduced.

Age at landing (a proxy for foreign work experience), language and Canadian work experience have the most predictive power regarding intermediate-term earnings, with language and Canadian work experience contributing (independently) 1.6 percentage points each, and age 1.2 percentage points to the R-squared value (Table 1). Recall that increasing age (a proxy for foreign work experience) negatively affects earnings.

In both the short- and intermediate-term models, the spousal variables have virtually no predictive power regarding the earnings of principal applicants (economic immigrants).

Studying in Canada has very little predictive power in either the short or intermediate term. There may be a number of reasons for this result. To the extent that language acquisition is part of the advantage received from having studied in Canada, it is already controlled for in the language variable. Hence, it is not part of the effect associated with having studied in Canada in this regression. Also, some people may continue studying in Canada after entry, and, hence, work part-time, thus affecting their earnings.

Regarding the contribution of the main independent variables—through shared variance or common components—again, only language and Canadian work experience are seen to work in combination to contribute to the predictive power of the regression. That contribution is not large, at 0.8 percentage points.

4.3 Predicting earnings in the longer term

To observe earnings after 10 to 11 years in Canada—defined here as the longer term—it is necessary to use the 1997–1999 entering cohort of economic immigrants (principal applicants only), aged 20 to 54 at entry. Regressions identical to those used for the short and intermediate term results in Table 1 are employed, with the same variables, defined in the same manner and with the same age restrictions.

Three models are run for the 1997–1999 entering cohort. All three use identical independent variables, but the dependent variable is, in Model 1, annual earnings after 1 to 2 years in Canada (since landing); in Model 2, after 5 to 6 years in Canada; and in Model 3, after 10 to 11 years in Canada. Models 1 and 2 are run only for purposes of comparison with the results for the 2002–2004 cohort. Model 3 predicts longer-term earnings. The coefficients in Appendix Table 1 (right panel) suggest that the results in Models 1 and 2 are similar to those reported above for the 2002–2004 landing cohort, with one major exception. In both the short- and intermediate-term outcomes for the 1997–1999 cohort, education at entry is strongly positively correlated with earnings. Among this cohort, at entry, immigrants with a bachelor's degree earned between 20% and 30% more than those with 10 or 12 years of schooling (Appendix Table 1). In comparison, for the 2002–2004 cohort, this advantage at entry for bachelor's degree holders fell to between 5% and 12%.

The earnings advantage associated with higher education (at landing) increased between the short and intermediate term for both cohorts. After 5 to 6 years in Canada, bachelor's degree holders earned roughly 25% to 38% more than immigrants with 10 to 12 years of schooling. These results are consistent with those observed by Picot, Hou and Qiu (2014). They found that entry earnings, among economic immigrants (principal applicants) with university education, declined among successive entering cohorts in the 2000s, to the point where their earnings were little above those of high-school graduates during their first few years in Canada. However, earnings grew much faster among the more highly educated, so that their earnings advantage returned after 5 to 10 years in the country.

The overall R-squared in the longer-term model is 8.5% (Table 1; the coefficients and variables for the longer-term model are in Appendix Table 1). That is, after 10 to 11 years in Canada, the variables used in the model accounted for 8.5% of the variation in earnings among immigrants. Among the variables in the regression model, education had the most predictive power, accounting for 2.1 percentage points of the R-squared (the unique or independent contribution). Thus, although education at entry is a weak predictor of earnings in the short term, in the longer term it is the strongest of the observed factors.

Age at landing was the next strongest predictor, accounting for 2.0 percentage points of the R-squared. As with education, the predictive power of age at entry increases with years spent in Canada. It is a better predictor of longer- rather than shorter-term earnings. Thus, the

advantage that the young entrants hold over their older counterparts increases with time spent in Canada.

The only other variable with any significant predictive power was language, having directly accounted for 1.4 percentage points of the R-squared. That is, if the language variable had not been present in the model, the share of the total variation in earnings accounted for by the model would have fallen by 1.4 percentage points. The predictive power of language skills at entry falls significantly from the short to intermediate to longer term.

Canadian work experience prior to entry, a strong predictor in the short term, becomes much weaker in the longer term, accounting for only 0.6 percentage points of the R-squared. As with the other models, studies in Canada prior to entry is a very weak predictor of longer-term earnings. Similar to the other models, spouses' characteristics had little predictive power in the longer term.

None of the main independent variables are seen to have a significant effect on the R-squared by operating in combination with other variables. None of the selected common components in Table 1 contributed significantly to the R-squared value.

4.4 Introducing interaction effects

It may be that it is not just the variables such as education, language and experience alone that matter. Variables may interact with one another, meaning that the effect of these variables may differ depending on the value that other variables take.[14] For example, higher education alone may not positively affect earnings, unless there are strong official-language skills to go with it. The lack of language skills may prevent the immigrant from achieving the economic benefits associated with higher education. Higher education combined with strong language skills would have a strong positive effect on earnings, but the same education without the language skills would not.

In another example, age at landing may have a very different effect on earnings depending upon whether immigrants have Canadian work experience or not. Among Canadian-born workers, increases in age (work experience) are associated with higher earnings. With Canadian work experience, immigrants may be thought of more as Canadian workers and receive the positive economic benefits of more work experience. Without Canadian work experience, immigrants are, in fact, penalized for their foreign work experience, and increases in age are associated with lower earnings. Hence, there may be an important interaction between age at landing and the existence of Canadian work experience.

Historically, immigration selection systems have ignored the possibility of interaction effects. Points were assigned independently for each factor, such as level of education, language skills, and work experience. For example, the points received for education were not in any way dependent upon the language skills of the individual. To the extent that the effects of some immigrant human capital factors depend on the presence of other characteristics, introducing interaction effects in a points system would improve its effectiveness. The empirical question is, are there interaction terms that significantly increase the predictive power of a regression equation? Are the economic effects of some human capital characteristics dependent upon the values taken on by other variables?

To answer this question, interaction terms between the key independent variables are added to the models in the earlier sections. The interaction terms are added, one at a time, (and dropped

14. Having variables that interact with one another is different than having variables that are correlated, or have shared variance that results in the "common components" described earlier. A variable interacts with another if its effect (on the dependent variable) changes, depending on the value of the second variable with which it is interacting.

from the regression when a different interaction term is added) to measure the effect of the interaction term on the R-squared value. The effect is simply the difference in the R-squared between the regression with the interaction term and the one without. Due to their large number, the regression coefficients are not shown here, but are available upon request.

The results of this exercise are shown in Table 2. The specific interaction terms examined are listed in those tables. The models were run using both the 2002–2004 and 1997–1999 cohorts, as before. Overall, none of the interaction terms had, by themselves, a large effect on the R-squared value. The R-squared rose by between 0 and 0.4 percentage points when the interaction terms were added, one at a time.

That said, some interaction terms appeared to be more important than others. Two interaction effects involving Canadian work experience were important when focusing on short-term earnings. The effect of both education and age at landing on entry earnings was quite different depending upon whether Canadian work experience was or was not present.

Table 2
The relative importance of interaction between factors in explaining earnings of principal applicants (economic immigrants) by years since landing and landing cohort

	2002–2004 cohort		1997–1999 cohort		
	1 to 2 years	5 to 6 years	1 to 2 years	5 to 6 years	10 to 11 years
	Model 1	Model 2	Model 1	Model 2	Model 3
R-squared of the full model	0.136	0.070	0.096	0.078	0.085
Increase in R-squared when interaction is added					
Age × education	0.001	0.002	0.004	0.004	0.003
Age × language	0.002	0.002	0.002	0.002	0.002
Age × Canadian work experience	0.003	0.003	0.003	0.002	0.001
Age × studies in Canada	0.000	0.000	0.001	0.001	0.001
Education × language	0.003	0.002	0.002	0.002	0.001
Education × Canadian work experience	0.004	0.002	0.002	0.001	0.002
Education × studies in Canada	0.001	0.001	0.001	0.001	0.001
Language × Canadian work experience	0.001	0.000	0.001	0.001	0.001
Language × studies in Canada	0.000	0.001	0.001	0.001	0.001
Canadian work experience × studies in Canada	0.002	0.002	0.002	0.001	0.001

Note: The variables listed on the left-hand side of the table were measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

4.5 How does Canadian work experience moderate the education and age effects?

To better assess these interaction effects, separate regressions were run for two groups, those with some Canadian work experience and those without among the 2002–2004 cohort of entering economic immigrants (principal applicants). The dependent variable (that is, their annual earnings during the first two full years in Canada), as well as the independent variables, are the same as those used in earlier regressions. The coefficients are shown in Appendix Table 2. The sample sizes were quite large for both groups, but much larger among those without Canadian work experience.

As noted earlier, the wage premium for higher education was almost zero among immigrants, in general, during their first few years in Canada. But those with Canadian work experience received a higher earnings premium for their education. For example, the regression in Appendix Table 2 shows that, among those with Canadian work experience, bachelor's degree holders earned from 28% to 55% more in their first two years after landing than their counterparts with 10 to 12 years of schooling. Meanwhile, the regression based on entering immigrants without Canadian work experience shows that bachelor's degree holders earned only from 0% to 9% more than those with 10 to 12 years of education.

Having Canadian work experience also had a significant effect on how the labour market viewed age at entry, a proxy for foreign experience. The regressions in Appendix Table 2 show that, among those with Canadian work experience, older principal applicants had higher entry earnings than their younger counterparts. For example, those in the 45-to-49 age group at landing earned 35% more than those in the 25-to-29 age group. That is, workers with more experience earned more than those with less, as one would expect (other things being equal). But among principal applicants without Canadian work experience at entry, this was not the case. Those aged 45 to 49 earned 25% less than their counterparts aged 25 to 29 at entry. Thus, the well-known observation that immigrants to Canada, in general, receive no or negative economic returns for their foreign work experience is driven by those without Canadian work experience prior to landing.

It appears that principal applicants with Canadian work experience prior to landing are treated more like Canadian workers in the labour market, regarding the returns to education and experience. They receive a wage premium for both education and work experience, as Canadian workers do. Entering principal applicants without Canadian work experience received minimal returns for more education or experience, at least regarding short-term earnings.

Similar regressions were run using intermediate-term earnings (5 to 6 years after landing) as the outcome variable for the 2002–2004 entering cohort (see Appendix Table 2, right panel). The results were similar. Among principal applicants without Canadian work experience, the more highly educated received somewhat higher earnings than the less educated. However, among principal applicants with Canadian work experience, the highly educated had a much higher earnings advantage compared to the less educated. Regarding age at landing, the intermediate-term results are very similar to the short-term earnings. Principal applicants with Canadian work experience receive positive returns to foreign work experience (i.e., age at entry); those without Canadian work experience receive negative returns.

4.6 How does language moderate the education and age effects?

Language is the second variable associated with some important interaction effects. Again, the effect of both education and age on entry earnings may vary, depending upon whether the immigrant has strong or weak official-language skills. To more closely examine this effect, separate regressions were run for three language groups: those with an English or French mother tongue (likely the highest proficiency in an official language); those with another mother tongue, but who speak English or French; and those who do not speak English or French. The sample is based on the 2002–2004 entering cohort of economic immigrants (principal applicants), aged 20 to 54 at landing. Two sets of regressions are run using both short-term (1 to 2 years after landing) and intermediate-term (5 to 6 years after landing) earnings.

Generally speaking, the results show that the earnings advantage of having a higher education (as compared to a high-school education) is much larger among principal applicants with strong language skills at entry than among those with weak skills. For example, bachelor's degree holders whose mother tongue was English or French had entry earnings that were 27% to 42% higher than those observed among their colleagues with 10 to 12 years of schooling (Appendix Table 3). Principal applicants with "another" mother tongue but who spoke English or French

saw no entry earnings advantage to holding a degree (as has been the case with most entering immigrants in the 2000s). Among those not speaking English or French, having a degree had a negative effect on earnings. The results, based on intermediate-term earnings, displayed a similar ranking: the earnings advantage to degree holders was highest among those in the highest language-skills category, second highest in the second language-skills category, and lowest among the principal applicants who spoke neither English nor French.

A similar pattern is observed regarding the effect of language on the returns to age at landing. Those entering with a mother tongue that was English or French do not experience a significant negative effect of age on earnings, either in the short or intermediate term.[15] However, among the two other language categories, the negative effect of age on earnings is observed, both on the short- and intermediate-term earnings.

Thus, the evidence suggests that, introducing the interaction between Canadian work experience and both age at entry and education, as well as between language, and age and education, could improve a points-based selection system, if the objective is to maximize earnings among economic immigrants (principal applicants).

5 Conclusion

This paper asks which human capital variables currently observed at landing best predict the economic outcomes of economic immigrants (principal applicants) in the short, intermediate and longer term. This is valuable information for the selection of economic immigrants, if the objective is to promote high levels of immigrant earnings. Using annual earnings as the outcome measure, this study finds that language background at landing and Canadian work experience at landing are the best predictors of entry earnings (first 2 years after landing) for immigrants (principal applicants). However, education at landing and age at landing (a proxy for foreign work experience) are the best predictors of longer-term earnings (10 to 11 years after landing).

The predictive power of immigrant characteristics changes with years spent in Canada. Language at landing is one of the most important variables (of those available to us in the historical data) when focusing on earnings in the short term. But this variable becomes less important as an entering cohort increases its tenure in Canada. This is likely because those principal applicants without the stronger skills in French or English at landing acquire them and they start to look more like those with strong official-language skills at entry.

A similar pattern emerges for Canadian work experience prior to landing. It is a good predictor of economic outcomes in the short term, but less so in the longer term. Education and age at landing are the two variables for which predictive power increases with time spent in Canada. Among the entering cohorts of principal applicants during the 2000s, those with higher education earned little more than those with less education immediately following landing. But the earnings trajectory of the highly educated is much steeper, so that a significant earnings advantage for higher education develops after 5 to 10 years in Canada. Education then becomes the best predictor of earnings among the variables available. Generally speaking, the older an economic immigrant at landing, the less well that person does in the labour market. This effect increases with time spent in Canada, making age a relatively strong predictor of longer-term earnings, but not necessarily short-term outcomes.

15. The exception is the negative effect on intermediate-term earnings of being over age 50 at landing (Appendix Table 3).

Some interaction effects are also important. The predictive power of education and age (in part a proxy for foreign work experience) are influenced by the interaction with two other variables, language skills and Canadian work experience. For example, the earnings premium for higher education is much larger if the principal applicant has strong rather than weak official-language skills. Language skill is also seen to interact with age at landing.

Immigrants with Canadian work experience before landing appear to be viewed by the labour market more like Canadian-born workers. For example, they receive positive economic returns to age at landing. In contrast, for those without Canadian work experience, the majority of principal applicants, the older at entry (the more foreign work experience), the lower the earnings (i.e., negative returns to foreign experience). Similarly, immigrant workers with Canadian work experience receive a premium for higher education immediately following landing, as a Canadian worker would. But those without Canadian work experience prior to landing receive virtually no education premium at entry and a smaller premium even after spending a number of years in Canada.

Finally, there are many characteristics and events that affect the earnings of entering immigrants besides the observed factors in the historical data. About 15% of the variation in individual entry earnings is accounted for in the regression models used here. Furthermore, the ability of these human capital variables, measured at entry, to predict earnings decreases as the cohort spends more time in Canada. The share of the variation in individual earnings falls from 15% in the models of short-term earnings, to 7% to 8% for intermediate- and longer-term earnings.

Additional data on potentially important variables would improve the predictive power of immigrant earnings models. Collecting information on variables (prior to landing), such as the specific post-secondary institution of graduation, the field of study, the language of instruction, details of trades credentials, occupational equivalency of foreign certification, and the degree of success in one's occupation would benefit future work. In addition, some of the variables employed in this work were proxies, notably official-language skills. These variables are currently being measured directly in applications for immigration to Canada. Using these better measures will reduce measurement errors in future work.

6 Appendix Tables

Appendix Table 1-1
Coefficients from ordinary least squares regression models predicting employment earnings of principal applicants (economic immigrants), by years since landing and landing cohort — Part 1

	2002–2004 cohort, by years after landing		1997–1999 cohort, by years after landing		
	1 to 2 years	5 to 6 years	1 to 2 years	5 to 6 years	10 to 11 years
	Model 1	Model 2	Model 1	Model 2	Model 3
			coefficient		
Intercept	9.61 ***	10.01 ***	9.75 ***	10.01 ***	10.13 ***
Age (reference: 25 to 29 years)					
20 to 24	-0.06 **	-0.07 **	0.02	0.02	0.00
30 to 34	-0.04 ***	-0.07 ***	-0.13 ***	-0.13 ***	-0.11 ***
35 to 39	-0.09 ***	-0.15 ***	-0.20 ***	-0.20 ***	-0.22 ***
40 to 44	-0.13 ***	-0.26 ***	-0.31 ***	-0.32 ***	-0.35 ***
45 to 49	-0.20 ***	-0.36 ***	-0.37 ***	-0.43 ***	-0.50 ***
50 to 54	-0.22 ***	-0.44 ***	-0.30 ***	-0.46 ***	-0.62 ***
Education (reference: 10 to 12 years of schooling)					
9 or fewer years of schooling	0.02	0.15 ***	0.10 ***	0.04	0.00
13 or more years of schooling	0.01	0.20 ***	0.02	0.02	0.03
Trade or diploma, 12 or fewer years of schooling	0.19 ***	0.25 ***	0.16 ***	0.13 ***	0.15 ***
Trade or diploma, 13 or more years of schooling	0.04	0.20 ***	0.15 ***	0.18 ***	0.23 ***
Some university	-0.01	0.23 ***	0.19 ***	0.23 ***	0.32 ***
Bachelor, 14 or fewer years of schooling	0.12 ***	0.34 ***	0.21 ***	0.25 ***	0.32 ***
Bachelor, 15 or more years of schooling	0.05 *	0.35 ***	0.32 ***	0.38 ***	0.44 ***
Master's, 16 or fewer years of schooling	-0.02	0.24 ***	0.30 ***	0.38 ***	0.44 ***
Master's, 17 or more years of schooling	0.09 ***	0.41 ***	0.40 ***	0.45 ***	0.53 ***
Doctorate	0.13 ***	0.44 ***	0.46 ***	0.65 ***	0.77 ***
Language (reference: not speaking English or French)					
Mother tongue English, unilingual	0.74 ***	0.52 ***	0.60 ***	0.50 ***	0.46 ***
Mother tongue French, unilingual	0.00	0.09	0.17 *	0.03	0.26 ***
Mother tongue English/French, bilingual	0.69 ***	0.37 ***	0.42 ***	0.33 ***	0.31 ***
Other mother tongue, English	0.32 ***	0.16 ***	0.14 ***	0.11 ***	0.10 ***
Other mother tongue, French	0.01	-0.04	-0.04	0.00	0.04
Other mother tongue, bilingual	0.35 ***	0.18 ***	0.25 ***	0.25 ***	0.21 ***
Years of Canadian work experience (reference: none)					
More than 0 to less than 1	0.66 ***	0.35 ***	0.61 ***	0.37 ***	0.30 ***
1 to less than 2	0.70 ***	0.41 ***	0.67 ***	0.44 ***	0.31 ***
2 to less than 3	0.94 ***	0.58 ***	0.79 ***	0.49 ***	0.37 ***
3 to less than 4	1.01 ***	0.60 ***	0.78 ***	0.50 ***	0.37 ***
4 to less than 5	1.18 ***	0.74 ***	0.84 ***	0.52 ***	0.36 ***
5 or more	1.30 ***	0.79 ***	0.91 ***	0.56 ***	0.38 ***
Years of study in Canada (reference: none)					
More than 0 to less than 1	-0.01	-0.02	0.01	-0.01	0.09 *
1 to less than 2	-0.18 ***	-0.09 **	-0.03	0.11 ***	0.19 ***
2 to less than 3	-0.08 ***	0.00	-0.18 ***	-0.01	0.10 ***
3 to less than 4	-0.23 ***	-0.03	-0.37 ***	-0.14 ***	-0.03
4 to less than 5	-0.19 ***	-0.08 *	-0.31 ***	-0.09 *	-0.04
5 or more	-0.26 ***	-0.19 ***	-0.35 ***	-0.19 ***	-0.05 *

* significantly different from reference category ($p<0.05$)

** significantly different from reference category ($p<0.01$)

*** significantly different from reference category ($p<0.001$)

Note: Independent variables in this table are measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

Appendix Table 1-2
Coefficients from ordinary least squares regression models predicting employment earnings of principal applicants (economic immigrants), by years since landing and landing cohort — Part 2

	2002–2004 cohort, by years after landing		1997–1999 cohort, by years after landing		
	1 to 2 years	5 to 6 years	1 to 2 years	5 to 6 years	10 to 11 years
	Model 1	Model 2	Model 1	Model 2	Model 3
			coefficient		
No spouse	-0.05 ***	-0.01	-0.06 ***	-0.03 **	-0.01
Spouse's education (reference: 10 to 12 years of schooling)					
9 or fewer years of schooling	0.01	-0.02	-0.04 *	0.00	0.01
13 or more years of schooling	0.03	0.06 **	0.07 **	0.12 ***	0.17 ***
Trade or diploma, 12 or fewer years of schooling	0.01	0.04 *	0.04 *	0.06 ***	0.06 ***
Trade or diploma, 13 or more years of schooling	0.00	0.07 ***	0.03 *	0.04 **	0.06 ***
Some university	0.02	0.11 ***	0.10 ***	0.10 ***	0.07 ***
Bachelor, 14 or fewer years of schooling	0.14 ***	0.14 ***	0.07 ***	0.13 ***	0.11 ***
Bachelor, 15 or more years of schooling	0.08 ***	0.15 ***	0.13 ***	0.17 ***	0.19 ***
Master's, 16 or fewer years of schooling	-0.01	0.01	0.09 **	0.03	0.09 ***
Master's, 17 or more years of schooling	0.10 ***	0.16 ***	0.17 ***	0.19 ***	0.22 ***
Doctorate	-0.02	0.06	0.10 **	0.17 ***	0.16 ***
Spouse's years of Canadian work experience (reference: none)					
More than 0 to less than 1	0.34 ***	0.21 ***	0.15 ***	0.10 **	0.14 ***
1 to less than 2	0.29 ***	0.27 ***	-0.04	-0.04	0.02
2 to less than 3	0.34 ***	0.17 ***	-0.23 **	-0.01	-0.08
3 or more	0.17 **	0.11 *	-0.22 ***	-0.09	-0.10
Spouse's years of study in Canada (reference: none)					
More than 0 to less than 1	0.12 *	0.11 *	0.03	0.04	0.16 **
1 to less than 2	-0.15 **	-0.14 **	0.03	0.01	0.04
2 to less than 3	-0.24 ***	-0.08	-0.11	-0.20 *	-0.19 *
3 or more	-0.37 ***	-0.28 ***	-0.15 *	-0.33 ***	-0.13
			number		
Sample size	141,789	151,480	131,939	132,253	123,327
			value		
R-squared	0.136	0.070	0.096	0.078	0.085

* significantly different from reference category (p<0.05)

** significantly different from reference category (p<0.01)

*** significantly different from reference category (p<0.001)

Note: Independent variables in this table are measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

Appendix Table 2-1
Coefficients from ordinary least squares regression models predicting employment earnings of principal applicants (economic immigrants), by years since landing and presence of pre-landing Canadian work experience, 2002–2004 landing cohort — Part 1

	1 to 2 years after landing		5 to 6 years after landing	
	With Canadian work experience	Without Canadian work experience	With Canadian work experience	Without Canadian work experience
	coefficient			
Intercept	10.15 ***	9.67 ***	10.39 ***	10.03 ***
Age (reference: 25 to 29)				
20 to 24	0.00	-0.06 *	0.05	-0.08 ***
30 to 34	0.08 **	-0.05 ***	0.03	-0.08 ***
35 to 39	0.15 ***	-0.11 ***	0.03	-0.16 ***
40 to 44	0.24 ***	-0.16 ***	0.06	-0.28 ***
45 to 49	0.35 ***	-0.25 ***	0.13 ***	-0.39 ***
50 to 54	0.33 ***	-0.31 ***	0.00	-0.50 ***
Education (reference: 10 to 12 years of schooling)				
9 or fewer years of schooling	-0.11	0.05	0.17	0.15 ***
13 or more years of schooling	0.42 **	-0.04	0.53 ***	0.16 ***
Trade or diploma, 12 or fewer years of schooling	0.03	0.21 ***	0.09	0.27 ***
Trade or diploma, 13 or more years of schooling	0.16 *	0.05	0.22 **	0.22 ***
Some university	0.28 ***	-0.05	0.36 ***	0.22 ***
Bachelor, 14 or fewer years of schooling	0.28 **	0.09 ***	0.44 ***	0.33 ***
Bachelor, 15 or more years of schooling	0.55 ***	0.00	0.64 ***	0.33 ***
Master's, 16 or fewer years of schooling	0.67 ***	-0.09 ***	0.73 ***	0.20 ***
Master's, 17 or more years of schooling	0.68 ***	0.02	0.78 ***	0.37 ***
Doctorate	0.43 ***	0.09 ***	0.67 ***	0.39 ***
Language (reference: not speaking English or French)				
Mother tongue English, unilingual	0.93 ***	0.72 ***	0.65 ***	0.50 ***
Mother tongue French, unilingual	0.74 **	-0.13	0.47	0.04
Mother tongue English/French, bilingual	0.76 ***	0.76 ***	0.42 ***	0.42 ***
Other mother tongue, English	0.55 ***	0.32 ***	0.31 ***	0.16 ***
Other mother tongue, French	0.45	0.01	-0.07	-0.04
Other mother tongue, bilingual	0.59 ***	0.35 ***	0.33 ***	0.18 ***
Years of Canadian work experience (reference: 5 years or more)				
More than 0 to less than 1	-0.56 ***	...	-0.35 ***	...
1 to less than 2	-0.50 ***	...	-0.29 ***	...
2 to less than 3	-0.29 ***	...	-0.15 ***	...
3 to less than 4	-0.22 ***	...	-0.13 **	...
4 to less than 5	-0.10 *	...	-0.03	...
Years of study in Canada (reference: none)				
More than 0 to less than 1	-0.21 ***	0.13	-0.20 ***	0.10 *
1 to less than 2	-0.32 ***	-0.04 ***	-0.21 ***	0.03
2 to less than 3	-0.23 ***	0.05 ***	-0.11 **	0.10 ***
3 to less than 4	-0.33 ***	-0.14 ***	-0.18 ***	0.09 **
4 to less than 5	-0.30 ***	0.00 *	-0.12 **	0.01
5 or more	-0.35 ***	0.02	-0.25 ***	0.01

... not applicable

* significantly different from reference category ($p<0.05$)

** significantly different from reference category ($p<0.01$)

*** significantly different from reference category ($p<0.001$)

Note: Independent variables in this table are measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

Appendix Table 2-2
Coefficients from ordinary least squares regression models predicting employment earnings of principal applicants (economic immigrants), by years since landing and presence of pre-landing Canadian work experience, 2002–2004 landing cohort — Part 2

	1 to 2 years after landing		5 to 6 years after landing	
	With Canadian work experience	Without Canadian work experience	With Canadian work experience	Without Canadian work experience
	coefficient			
No spouse	-0.11 **	-0.05 ***	-0.16 ***	-0.003
Spouse's education (reference: 10 to 12 years of schooling)				
9 or fewer years of schooling	0.17	0.00	-0.02	-0.02
13 or more years of schooling	0.09	0.02	0.02	0.06 *
Trade or diploma, 12 or fewer years of schooling	-0.04	0.01	-0.16 *	0.05 **
Trade or diploma, 13 or more years of schooling	0.06	-0.01	0.00	0.07 ***
Some university	-0.03	0.02	-0.10	0.12 ***
Bachelor, 14 or fewer years of schooling	0.05	0.15 ***	0.01	0.15 ***
Bachelor, 15 or more years of schooling	-0.02	0.09 ***	-0.02	0.16 ***
Master's, 16 or fewer years of schooling	-0.12	0.00	0.01	0.02
Master's, 17 or more years of schooling	0.04	0.10 ***	-0.01	0.17 ***
Doctorate	-0.08	0.00	-0.09	0.07 *
Spouse's years of Canadian work experience (reference: none)				
More than 0 to less than 1	0.22 ***	0.31 **	0.10 **	0.13 *
1 to less than 2	0.11 ***	0.48 ***	0.13 ***	0.28 ***
2 to less than 3	0.18 ***	0.43 **	0.03	0.26 ***
3 or more	-0.03	0.48 ***	-0.01	0.09
Spouse's years of study in Canada (reference: none)				
More than 0 to less than 1	-0.04	0.28 **	0.05	0.16 *
1 to less than 2	-0.13 *	-0.25 ***	-0.12	-0.16 *
2 to less than 3	-0.16	-0.41 ***	-0.13	0.00
3 or more	-0.49 ***	0.00	-0.34 ***	-0.05
	number			
Sample size	12,865	128,924	11,786	139,694
	value			
R-squared	0.208	0.045	0.124	0.037

* significantly different from reference category (p<0.05)

** significantly different from reference category (p<0.01)

*** significantly different from reference category (p<0.001)

Note: Independent variables in this table are measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

Appendix Table 3-1
Coefficients from ordinary least squares regression models predicting employment earnings of principal applicants (economic immigrants), by years since landing and language group, 2002–2004 landing cohort — Part 1

	1 to 2 years after landing			5 to 6 years after landing		
	Mother tongue English/ French	Other mother tongue, speak English/ French	Other mother tongue, do not speak official language	Mother tongue English/ French	Other mother tongue, speak English/ French	Other mother tongue, do not speak official language
	coefficient					
Intercept	10.02 ***	9.96 ***	9.87 ***	10.25 ***	10.17 ***	10.28 ***
Age (reference: 25 to 29)						
20 to 24	0.03	-0.08 **	-0.03	-0.03	-0.05	-0.11 *
30 to 34	0.06 *	-0.06 ***	0.02	0.04	-0.08 ***	-0.08 ***
35 to 39	0.10 ***	-0.14 ***	-0.02	0.06 *	-0.15 ***	-0.21 ***
40 to 44	0.05	-0.19 ***	-0.02	-0.02	-0.26 ***	-0.39 ***
45 to 49	0.02	-0.27 ***	0.00	-0.07 *	-0.36 ***	-0.48 ***
50 to 54	-0.04	-0.28 ***	-0.11	-0.28 ***	-0.47 ***	-0.43 ***
Education (reference: 10 to 12 years of schooling)						
9 or fewer years of schooling	0.31 ***	-0.11 *	0.00	0.58 ***	0.03	-0.12
13 or more years of schooling	0.22 **	0.01	-0.09	0.34 ***	0.23 ***	-0.16
Trade or diploma, 12 or fewer years of schooling	0.26 ***	0.14 ***	0.11	0.37 ***	0.25 ***	0.04
Trade or diploma, 13 or more years of schooling	0.30 ***	0.04	-0.21 ***	0.47 ***	0.18 ***	-0.06
Some university	0.25 ***	0.03	-0.40 ***	0.49 ***	0.25 ***	-0.09
Bachelor, 14 or fewer years of schooling	0.27 ***	0.05	-0.07	0.41 ***	0.28 ***	0.23 ***
Bachelor, 15 or more years of schooling	0.42 ***	0.03	-0.26 ***	0.59 ***	0.33 ***	0.10 *
Master's, 16 or fewer years of schooling	0.32 ***	-0.05	-0.31 ***	0.55 ***	0.20 ***	0.10
Master's, 17 or more years of schooling	0.52 ***	0.08 *	-0.28 ***	0.74 ***	0.39 ***	0.14 **
Doctorate	0.59 ***	0.10 **	-0.23 ***	0.78 ***	0.42 ***	0.10
Years of Canadian work experience (reference: none)						
More than 0 to less than 1	0.55 ***	0.70 ***	0.54 ***	0.33 ***	0.36 ***	0.35 ***
1 to less than 2	0.75 ***	0.69 ***	0.30 *	0.50 ***	0.39 ***	0.31 **
2 to less than 3	1.00 ***	0.93 ***	0.42 **	0.62 ***	0.58 ***	0.40 **
3 to less than 4	1.08 ***	0.98 ***	0.74 ***	0.66 ***	0.59 ***	0.38 *
4 to less than 5	1.27 ***	1.12 ***	0.91 ***	0.84 ***	0.69 ***	0.48 *
5 or more	1.31 ***	1.32 ***	0.43	0.88 ***	0.73 ***	-0.05
Years of study in Canada (reference: none)						
More than 0 to less than 1	-0.30 **	0.04	-0.13	-0.28 **	0.02	0.08
1 to less than 2	-0.26 **	-0.17 ***	-0.31 *	-0.25 **	-0.05	-0.16
2 to less than 3	-0.28 ***	-0.10 ***	0.43 **	-0.27 ***	0.03	0.13
3 to less than 4	-0.36 ***	-0.24 ***	0.12	-0.20 *	-0.01	0.23
4 to less than 5	-0.23 **	-0.20 ***	-0.43	-0.10	-0.08 *	0.10
5 or more	-0.44 ***	-0.25 ***	0.31	-0.31 ***	-0.17 ***	0.45

* significantly different from reference category (p<0.05)

** significantly different from reference category (p<0.01)

*** significantly different from reference category (p<0.001)

Note: Independent variables in this table are measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

Appendix Table 3-2
Coefficients from ordinary least squares regression models predicting employment earnings of principal applicants (economic immigrants), by years since landing and language group, 2002–2004 landing cohort — Part 2

	1 to 2 years after landing			5 to 6 years after landing		
	Mother tongue English/ French	Other mother tongue, speak English/ French	Other mother tongue, do not speak official language	Mother tongue English/ French	Other mother tongue, speak English/ French	Other mother tongue, do not speak official language
	coefficient					
No spouse	-0.21 ***	-0.02	-0.07 *	-0.19 ***	0.01	0.01
Spouse's education (reference: 10 to 12 years of schooling)						
9 or fewer years of schooling	-0.03	0.02	-0.03	-0.07	-0.04	0.04
13 or more years of schooling	-0.09	0.06 *	0.03	-0.04	0.09 **	-0.06
Trade or diploma, 12 or fewer years of schooling	-0.10 *	0.00	0.03	-0.07	0.04	0.08 *
Trade or diploma, 13 or more years of schooling	-0.01	0.00	-0.03	-0.01	0.08 ***	0.07 *
Some university	-0.05	0.05 **	-0.01	-0.09	0.12 ***	0.15 ***
Bachelor, 14 or fewer years of schooling	-0.09	0.13 ***	0.31 ***	0.02	0.12 ***	0.30 ***
Bachelor, 15 or more years of schooling	-0.13 ***	0.13 ***	0.01	-0.06 *	0.19 ***	0.14 ***
Master's, 16 or fewer years of schooling	-0.23	0.01	0.11	-0.18	0.03	0.07
Master's, 17 or more years of schooling	-0.08	0.14 ***	0.02	-0.06	0.18 ***	0.18 ***
Doctorate	-0.17	0.03	-0.11	-0.22 *	0.11 **	-0.03
Spouse's years of Canadian work experience (reference: none)						
More than 0 to less than 1	0.19 **	0.37 ***	0.59 **	0.17 **	0.19 ***	0.28
1 to less than 2	0.19 ***	0.30 ***	0.24	0.21 ***	0.26 ***	0.39
2 to less than 3	0.17 **	0.38 ***	-0.51	0.13	0.18 ***	-0.25
3 or more	-0.06	0.28 ***	0.01	-0.21 **	0.25 ***	-1.09
Spouse's years of study in Canada (reference: none)						
More than 0 to less than 1	0.16	0.08	0.40	0.05	0.07	0.82 ***
1 to less than 2	-0.35 *	-0.16 **	-0.11	-0.12	-0.17 **	0.15
2 to less than 3	0.19	-0.29 ***	-0.38	-0.13	-0.05	-0.49 *
3 or more	-0.63 ***	-0.35 ***	-0.20	-0.26	-0.29 ***	-0.12
	number					
Sample size	13,219	98,021	30,549	13,299	103,158	35,023
	value					
R-squared	0.240	0.081	0.018	0.132	0.051	0.031

* significantly different from reference category (p<0.05)

** significantly different from reference category (p<0.01)

*** significantly different from reference category (p<0.001)

Note: Independent variables in this table are measured at landing.

Source: Statistics Canada, Longitudinal Immigration Database.

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